



# Community structure of soil nematodes under different drought conditions

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## ABSTRACT

The study aims to investigate the effects of different drought treatments on the distribution of soil nematode community under the background of global warming. Light drought, moderate drought, severe drought treatments and control plot were set in the experiment. Experimental results showed that a total of 32 genera of nematodes from 18 families were identified under the four drought treatments, including 13 genera of bacterivores, 10 genera of plant-parasites, 4 genera of fungivores and 5 genera of omnivores-predators. *Eucephalobus* and *Helicotylenchus* were dominant genera under drought treatments. The quantity, genera and diversity of soil nematodes in drought treatments were significantly lower than those in control plots. The structure of the nematode community degenerated and the role of nematodes in soil food web was weakened in the agro-ecosystem after long-term drought. The study provides soil zoological basis for agro-ecosystem responding to extreme drought under climate change.

## 1. Introduction

Under the background of global warming, the occurrence frequency, intensity and extent of drought present an increasing trend over many agricultural areas, especially in North China (Dai, 2011; Mishra and Singh, 2010; Yang et al., 2014). Drought is one of the common natural disasters and has gained wide attention. Drought significantly affects the soil moisture, and the relative abundance and biodiversity of microbial community, thus altering the microbial functions of agro-ecosystem (Hueso et al., 2012). Previous studies on drought mainly focused on the productivity of crops affected, such as wheat, soybean and vegetable (Barba et al., 2016; Han and Yan, 2013; Rigby et al., 2016; Strauss et al., 2013). The variation of precipitation distribution influences the wheat agro-ecosystem in different soil types (Tataw et al., 2016). Soil nematodes are representative animals of farm soil animals, so we carried out research on soil nematodes selected as the object of study.

Soil nematodes can be divided into various taxonomic/functional types (Zhou et al., 2016) and > 500 different nematode species, including at least seven functional types (plant feeding nematodes, plant-associated nematodes, fungal hyphae-feeding nematodes, bacterial feeding nematodes, animal-parasitic nematodes, omnivorous nematodes, and unicellular eukaryotes nematodes) have been reported (Gaugler, 1987; Yeates et al., 1993b; Yeates et al., 1999). These functional types can sensitively respond to a variety of cultivation,

fertilization, pesticides and water contents (Kalinkina et al., 2016). However, due to extensive application of pesticides and fertilizers, the relative abundance and biodiversity of nematodes significantly decrease in the agro-ecosystem (Majić et al., 2010; Ulu et al., 2016). In addition, the effects of different drought treatments on soil nematode community structure in the agro-ecosystem were seldom reported.

Nematodes are an effective bio-indicator for the responses of the agro-ecosystem to drought events under climate changes. In this study, under three different drought treatments, the biodiversity of species, trophic treatments, and functional structures of soil nematodes were investigated. Meanwhile, the natural climate condition was also set as the drought control system. Soil nematodes were classified and then assessed with various ecological indices.

## 2. Methods

### 2.1. Study area

The experiment was conducted at the Hydrological Experiment Station of Wudaogou (33°09'N, 117°21'E), Anhui Province, China (Fig. 1). The region experiences a sub-humid warm temperate continental monsoon climate with a mean annual precipitation of 704.2 mm and mean annual temperature of 14.7 °C. This region belongs to the typical agro-ecosystem associated with winter wheat. Winter wheat was sown in late October and harvested in June of the next year.

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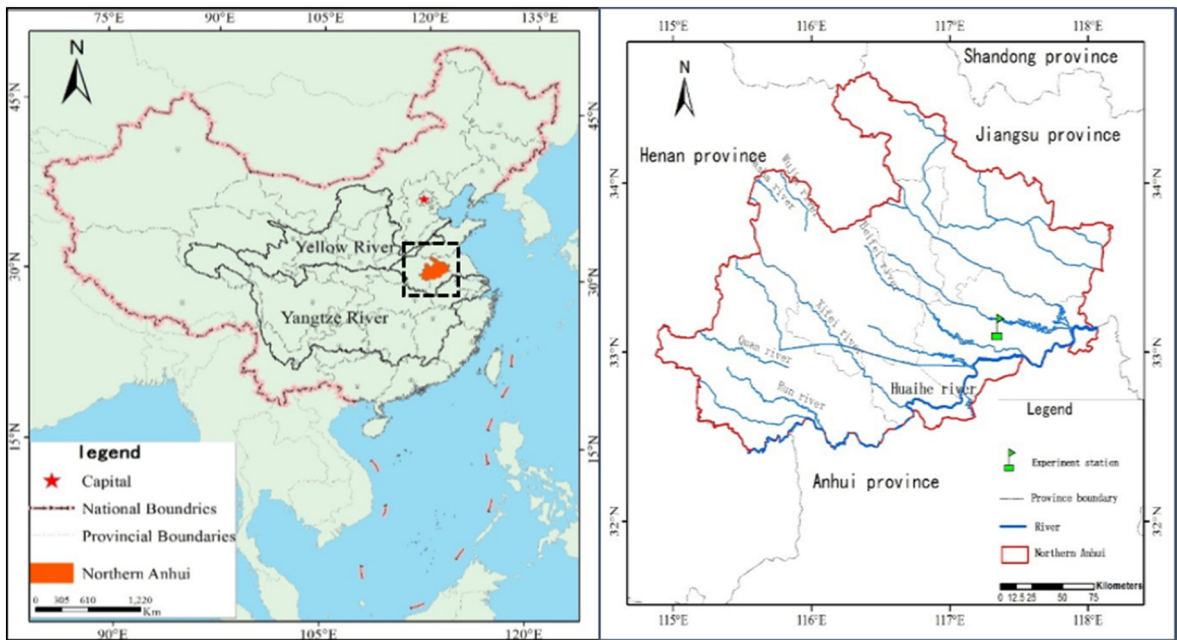


Fig. 1. The geographical location of Northern Anhui and Experiment station.

The main soil type of this region is Mortar Black Soil. Soil contains 17.67 g kg<sup>-1</sup> soil organic matter, 74.7 mg kg<sup>-1</sup> available nitrogen, 15.6 mg kg<sup>-1</sup> available phosphorus, and 247.1 mg kg<sup>-1</sup> available potassium.

2.2. Experimental design and experimental conditions

Consecutive rainless days are an indicator for drought which has continuous non-effective rainfall days, so consecutive rainless days is a common index of drought. According to the statistical data of consecutive rainless days in Anhui Province (Table 1), four drought treatments (control plot, light drought, moderate drought, and severe drought) were designed to investigate the effects of drought on soil nematode community structure. The consecutive rainless days of light drought (LD), moderate drought (MD) and severe drought (SD) were respectively 15 days, 30 days, and 45 days. In particular, a control system (CK) was operated under the natural climate conditions. All the tests were conducted in the growth period of winter wheat. Totally 12 experimental plots (Length × Width = 4 m × 4 m) were designed and divided into 4 treatments to respectively simulate the CK, LD, MD, and SD treatments. Each drought treatment had 3 replicates. Stainless steel baffle was used to prevent external water, fertilizers and other soil animals. Drought treatments were sheltered under a ventilation shed to prevent external precipitation and simulate consecutive rainless conditions.

2.3. Soil sampling and nematode identification

All soil nematode samples were collected in the growth season of winter wheat (Liang-Nong 66) from April to June in 2015. Soil was sampled randomly at the 0–15 depth at typical sites, and mixed carefully to obtain a total of 36 composite samples. Stone, larger roots and

macro-arthropods were excluded by hand. The soil samples were placed in the sealed plastic bags and immediately stored in the fridge at 4 °C. All the soil samples were preliminarily processed within a week.

The nematode population was extracted from a soil sample (100 g) according to Baermann Funnel Procedure (Sasser, 1962). After an extraction of 48 h, nematodes were preserved in 4% formaldehyde, counted, and then adjusted to 100 g dry soil. The abundance of nematodes is expressed as the quantity of nematodes per 100 g dry soil. Soil nematodes were counted and identified under an inverted compound microscope (Zhong et al., 2016).

2.4. Ecological indices

Based on the feeding habits, stoma and esophageal morphology, all the extracted soil nematodes were assigned to four trophic treatments (Yeates et al., 1993a, 1993b): Bacterivores (Ba), Fungivores (Fu), Plant-parasites (PP) and Omnivore-predators (OP). The classification of nematode colonizer-persister (c-p) value was performed based on life history strategies (Bongers, 1990; Bongers and Bongers, 1998). The characteristics of nematode community were assessed with the following ecological indices:

- a) Shannon-Weiner diversity index,  $H'$  (Mulder et al., 2005),  $H' = -\sum Pi(\ln Pi)$ ;
  - b) Evenness index,  $J$  (Mulder et al., 2005),  $H' = H' / \ln(S)$ ;
  - c) Simpson index,  $\lambda$  (Mulder et al., 2005),  $\lambda = \sum Pi^2$ ;
  - d) Nematode channel ratio, NCR (Yeates, 2003a),  $NCR = Ba / (Ba + Fu)$ ;
  - e) Maturity index, MI (Yeates et al., 1993a),  $MI = \sum (c - pi)vi'$ ;
  - f) Plant parasite index, PPI (Yeates et al., 1993a),  $PPI = \sum (c - pi)vi'$ ;
- where  $Pi$  represents the proportion of each taxon in the total population;  $c-pi$  is the  $c-p$  value for the free-living nematodes to the  $i$ -th nematode genus;  $vi'$  indicates the proportion of the genus in the nematode community.

According to faunal methods, the formula is as follows: Enrichment index,  $EI = 100 (e / (e + b))$ , which is used to assess the food web response to the available resources; Structure index,  $SI = 100(s / (s + b))$ , which is used to indicate changes in the structure of soil food web under interference (Ferris et al., 2001).

where  $e$  is the abundance of individuals in guilds in the enrichment component weighted by their respective  $k_e$  values,  $b$  is the abundance of

Table 1

Drought index system in Anhui province.

Degree of drought	LD (light drought)	MD (moderate drought)	SD (severe drought)
Consecutive rainless days	10~20	20~40	40~55

**Table 2**  
Soil nematode community compositions in different drought conditions.

Genera species	c-p Value	CK		LD		MD		SD	
		Abundance (%)	Dominance	Abundance (%)	Dominance	Abundance (%)	Dominance	Abundance (%)	Dominance
<i>Ba</i>		45.8		41.5		28.6		34.0	
<i>Eucephalobus</i>	2	14.2	+++	10.9	+++	13.0	+++	10.2	+++
<i>Cephalobus</i>	2	0.6	+	3.2	++	0.7	+	0.8	+
<i>Chiloplacus</i>	2	3.8	++	0.9	+	1.4	++		
<i>Acrobeles</i>	2	2.7	++	4.7	++	4.0	++	6.1	++
<i>Cervidellus</i>	2	4.2	++						
<i>Placodira</i>	2	0.6	+	1.5	++				
<i>Acrobeloides</i>	2	1.9	++	12.4	+++	5.1	++	10.7	+++
<i>Diplogaste</i>	1	7.5	++	3.5	++			5.3	++
<i>Plectus</i>	2			2.9	++	3.6	++		
<i>Rhabditis</i>	1	5.0	++	0.0		0.7	+	0.0	
<i>Caenorhabditis</i>	1	2.9	++	0.0				0.8	+
<i>Protorhabditis</i>	1	1.7	++	1.5	++				
<i>Brevibucca</i>	3	0.6	+						
<i>Fu</i>		13.6		15.9		14.9		14.8	
<i>Aphelenchus</i>	2			4.4	++	4.7	++	6.6	++
<i>Paraphelenchus</i>	2	2.5	++	0.9	+	0.7	+	0.8	+
<i>Aphelenchoides</i>	2	10.3	+++	7.9	++	9.4	++	7.4	++
<i>Ditylenchus</i>	2	0.8	+	2.6	++				
<i>PP</i>		22.6		25.6		37.3		39.8	
<i>Tylenchus</i>	2	1.9	++	4.4	++	12.7	+++	7.8	++
<i>Filenchus</i>	2	2.5	++						
<i>Malenchus</i>	2	0.4	+	0.9	+				
<i>Cephalenchus</i>	2	1.0	++	2.4	++	2.9	++	3.3	++
<i>Psilenchus</i>	2	0.6	+					2.9	++
<i>Pararotylenchus</i>	3	1.3	++	2.1	++	3.3	++	0.8	
<i>Rotylenchus</i>	3	0.6	+	1.5	++	0.7	+	4.5	++
<i>Helicotylenchus</i>	3	10.7	+++	12.6	+++	12.0	+++	13.5	+++
<i>Pratylenchus</i>	3	0.0		1.8	++	3.6	++		
<i>Paratylenchus</i>	2	3.6	++			2.2	++	7.0	
<i>OP</i>		18.0		17.1		19.2		11.5	
<i>Dorylaimus</i>	4	3.8	++	5.0	++	11.2	+++	3.7	++
<i>Enchodelus</i>	4	0.6	+	0.6	+				
<i>Mesodorylaimus</i>	4	5.2	++	3.5	++	2.5	++	2.9	++
<i>Eudorylaimus</i>	4	0.6	+	3.2	++	0.7	+	0.0	
<i>Aporcelaimus</i>	5	7.7	++	4.7	++	4.7	++	4.9	++

Note: Abundance that was > 10% denoted dominant genera and used; + + +; to denote. Abundance that was > 1% and < 10% denoted general genera and used; + +; to denote. Abundance that was < 1% denoted rare genera and used; +; to denote.

individuals in the basal component weighted by their  $k_b$  values, and  $s$  is the abundance of individuals in the structural component weighted by their  $k_s$  values.

### 2.5. Data analysis

The related data of nematodes were transformed by  $\log(X + 1)$  to obtain the normality data. The one-way analysis of variance was used to detect the significance of the quantity, genus and ecological indices under different drought treatments in SPSS 22 software package;  $P < 0.05$  was considered as the significant level.

## 3. Results

### 3.1. Community composition of soil nematodes

The community composition of soil nematodes showed a significant difference under different drought treatments (Table 2). The total quantity of soil nematodes in four drought treatments was 4014. The distribution density of soil nematodes was 111.5 individual/100 g dry soil and all the soil nematodes were classified into 32 genera of nematodes belonging to 18 families. In general, *Eucephalobus* (12.1%-mean) and *Helicotylenchus* (12.2%-mean) were the dominant genera under three different drought treatments, followed by *Acrobeles* (4.4%-mean), *Acrobeloides* (7.5%-mean), *Aphelenchoides* (8.7%-mean), *Cephalenchus* (3.4%-mean), *Dorylaimus* (5.9%-mean), and *Aporcelaimus*

(5.5%-mean).

In the CK, LD, MD, and SD treatments (Fig. 2), the quantities of genera detected in four treatments were 29, 25, 21, and 19, respectively. The quantities of soil nematodes collected in each soil treatment were respectively 1434, 1020, 828, and 732 individuals and the distribution density of soil nematodes was 159.3, 113.3, 92.0 and 81.3 individual/100 g dry soil, respectively.

In the CK treatment (Fig. 3), *Ba* nematode accounted for the highest proportion (45.8%) in the total soil nematodes, followed by *PP* (22.6%), *OP* (18.0%), and *Fu* (13.6%). At the genus level, the genera of *Eucephalobus*, *Aphelenchoides*, and *Helicotylenchus* were the dominant nematodes in the CK treatment, followed by *Diplogaste* and *Rhabditis*. In addition, *Cephalobus*, *Ditylenchus* and so on were the rare genera found in the CK treatment. In the LD treatment, *Ba* nematode also had the highest proportion (41.5%) in the total soil nematodes, followed by *PP* (25.6%), *OP* (17.1%), and *Fu* (15.9%). At the genus level, *Eucephalobus*, *Acrobeloides* and *Helicotylenchus* were dominant genera, followed by *Cephalobus* and *Mesodorylaimus*. *Chiloplacus*, *Psilenchus* and so on were the rare genera. In the MD treatment, *PP* nematode also had the highest proportion (37.3%) in the total soil nematodes, followed by *Ba* (28.6%), *Fu* (19.2%), and *OP* (14.9%). At the genus level, the genera of *Eucephalobus*, *Tylenchus*, *Helicotylenchus* and *Dorylaimus* were the dominant nematode species, followed by *Aphelenchoides* and *Acrobeloides*. The rare genera found in this treatment were *Rhabditis* and *Cephalobus*. In the SD treatment, *PP* nematode was the dominant abundant nematode accounting for 39.8%, followed by *Ba* (34.0%), *Fu* (14.8%), and *OP*

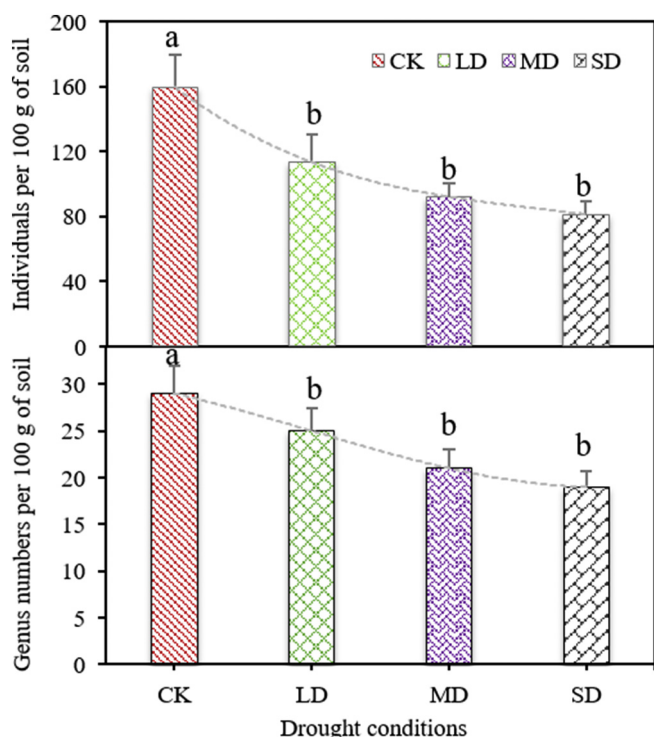


Fig. 2. Number and genera of soil nematode in the different drought conditions. Note: The numerical is average + standard error; Different small letters in the same row indicated significant difference among the treatments at 0.05 ( $n = 36$ ).

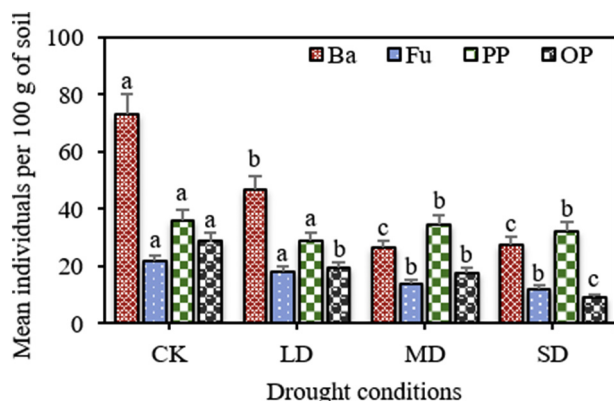


Fig. 3. Trophic groups of soil nematodes under different drought situations. Note: The numerical is average + standard error; Different small letters in the same row indicated significant difference among the treatments at 0.05 ( $n = 36$ ).

(11.5%). At the genus level, the dominant genera were *Eucephalobus*, *Helicotylenchus* and *Acrobeloides*, followed by *Aphelenchus* and *Acrobeles*. The rare genera found in the treatment were *Caenorhabditis* and *Cephalobus*.

### 3.2. Structure of soil nematode c-p guilds

According to life history strategies, soil nematodes which live on land and in water can be classified as 5 colonizer-persister (c-p) scales from r-strategist to k-strategist. In the CK treatment (Fig. 4), cp-2 guild also had the highest proportion (51.67%) in the total soil nematodes, followed by cp-1 (17.15%), cp-3 (13.18%), cp-4 (10.25%), and cp-5

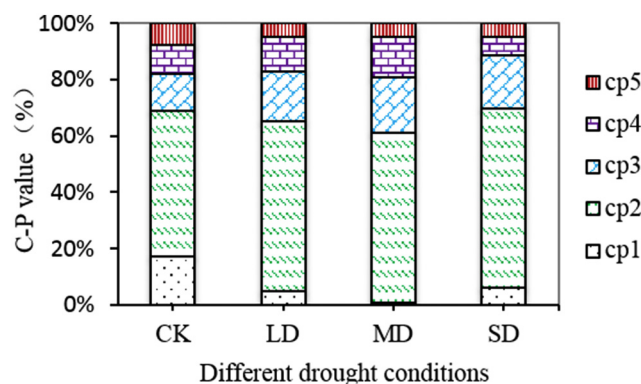


Fig. 4. The proportion of c-p guilds under different drought situations.

(7.74%). In the LD treatment, cp-2 guild also had the highest proportion (51.13%) in the total soil nematodes, followed by cp-3 (15.29%), cp-4 (10.53%), cp-1 (4.26%), and cp-5 (4.01%). In the MD treatment, cp-2 guild also had the highest proportion (68.44%) in the total soil nematodes, followed by cp-3 (22.13%), cp-4 (16.39%), cp-5 (5.33%), and cp-1 (0.82%). In the SD treatment, cp-2 guild also had the highest proportion (63.52%) in the total soil nematodes, followed by cp-3 (18.85%), cp-4 (6.56%), cp-1 (6.15%), and cp-5 (4.92%).

### 3.3. Analysis of community diversity of soil nematodes

The ecological indices of soil nematode community are shown in Table 3. Biodiversity characteristics are generally assessed with Shannon-Weiner diversity index ( $H'$ ), Simpson index ( $\lambda$ ) and Evenness index ( $J$ ). The higher values of  $H$  and  $J$  mean the more evenness of nematode community. The lower value of  $\lambda$  represents the more evenness of nematode community. The  $H'$  value of nematode community ranged from 2.48 (SD) to 2.94 (CK). Soil nematode community biodiversity of the four samples decreased in the following order: CK > LD > MD > SD. The  $J$  index of the four treatments varied from 0.8435 (SD) to 0.905 (LD) and decreased in the following order: LD > CK > MD > SD. The  $H$  index showed the similar order. The  $\lambda$  index of the four treatments varied from 0.0684 (CK) to 0.0836 (MD) and decreased in the following order: MD > SD > LD > CK.

Maturation index (MI) is an ecological index indicating the stability and disturbed degree of an ecosystem. The lower MI indicates that the ecosystem is less disturbed. This index is widely used as a biological indicator for monitoring environmental factors. The lower value of the nematode MI demonstrates that the soil ecosystem is seriously disturbed, whereas a higher MI indicates that the soil environment is in a relatively stable condition. Unlike the MI index, the lower PPI value indicates the more stable nematode community. The MI value of nematode community ranged from 2.42 (SD) to 2.62 (MD), the PPI value of nematode community ranged from 2.47 (SD) to 2.70 (LD).

It is generally accepted that NCR index can be used to describe the importance of *Ba* and *Fu* nematodes in the biodiverse decomposition channels. When the value of NCR index is > 0.5, soil organic matters are easily utilized by bacteria. The NCR value of all the samples were much higher than 0.5, indicating that the decomposition of soil organic matter mainly depended on bacteria. The NCR value of nematode community ranged from 0.658 (MD) to 0.771 (CK) and decreased according to the following order: CK > LD > SD > MD.

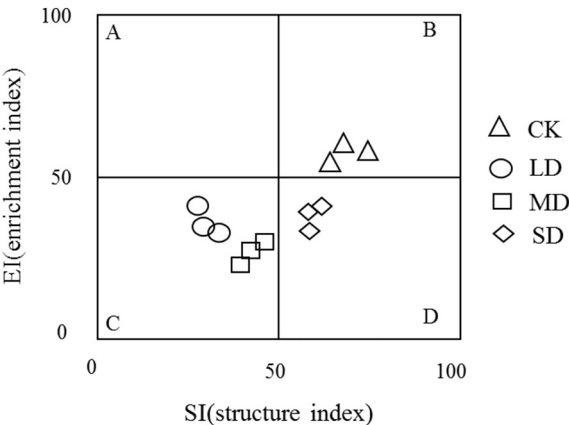
### 3.4. The faunal analysis of soil nematodes

The faunal analysis of soil nematodes are shown in Fig. 5. Structured index (SI) and enrichment index (EI) may provide insight into the nematode community structure in stressed, enriched, stable structured and decomposition environments, and provide information on the

**Table 3**  
The biodiversity analysis of soil nematode in four treatments.

Ecological index	CK	LD	MD	SD
Shannon index	2.94 ± 0.11a	2.91 ± 0.10a	2.57 ± 0.05b	2.48 ± 0.13b
Simpson index	0.0684 ± 0.02a	0.0696 ± 0.02a	0.0836 ± 0.07b	0.0729 ± 0.01a
Evenness index	0.874 ± 0.028a	0.905 ± 0.027b	0.8439 ± 0.018a	0.8435 ± 0.031a
Maturity index	2.51 ± 0.12a	2.52 ± 0.21a	2.62 ± 0.19a	2.42 ± 0.17b
Plant parasite index	2.56 ± 0.20a	2.70 ± 0.23a	2.52 ± 0.19a	2.47 ± 0.06a
Nematode channel ratio	0.771 ± 0.04a	0.722 ± 0.035a	0.658 ± 0.025b	0.698 ± 0.017b

Note: The value are average + standard error; different small letters in the same row indicated significant difference among the treatments at 0.05(n = 3).



**Fig. 5.** Soil nematode faunal analysis under different drought situations.

dynamics of the soil food web. By calculating the EI and the SI, the nematode flora can be divided into four quadrants.

In our study, The CK was in the A quadrant, indicating that soil nutrient status is better and higher level of disturbance. Compared with the CK, LD and MD were in C quadrant, indicating poor soil nutrient status and less disturbed. SD was in the D quadrant, indicating that nutrients in soil are in poor condition and subject to the highest level of disturbance, which has already caused environmental stresses and degraded food webs.

3.5. Correlation between soil nematode diversity indices and soil properties

The soil nematode diversity index is affected by soil physicochemical properties (Table 4). The least square method was used to analyze the correlation between soil nematode diversity and soil properties. The diversity of soil nematodes is positively correlated with available nitrogen, available phosphorus, available potassium, pH and organic matter. In a certain range, the increase of soil factors would lead to increase of soil diversity index. The soil temperature was negatively correlated with the diversity index of nematodes. The increase of soil temperature would lead to the decrease of soil nematode diversity index. Among them, the correlation coefficient between available nitrogen and soil nematode diversity was the most significant, the correlation coefficient was 0.8965, followed by available phosphorus, available potassium and soil temperature, respectively, 0.8935, 0.8832 and  $-0.8206$ . The lowest correlation between pH and soil nematode diversity was  $-0.7142$ .

**Table 4**  
The correlation of soil nematode diversity index and soil properties.

Soil properties	T	N	P	K	pH	OM
Correlation coefficient	$-0.8206$	0.8965	0.8832	0.8935	0.7142	0.8306

4. Discussion

4.1. Effects of different drought treatments on the quantity and genera of soil nematodes

The quantity and genera of soil nematodes in drought treatments were significantly lower than those in the CK. With the increase in drought days, the quantity and genera of soil nematodes significantly decreased. Previous studies indicated the abundance and proportion of soil nematode were highly sensitive to the changes in soil moisture and temperature (Bakonyi et al., 2007; Landesman et al., 2011; Xiu-Xia et al., 2007). The effect of soil moisture was more significant under dry conditions (Noy-Meir, 2003). Positive effects of soil moisture on nematode composition and density were observed in the Judean Desert and the northern Negev Desert (Liang and Steinberger, 2001; Noy-Meir, 2003). However, the results indicated the positive effect of drought treatment on soil nematode in agro-ecosystems. In the study, we found that drought decreased the quantity and genera of soil nematode. The difference may be interpreted as follows. Soil nematodes have a certain tolerance to drought after a short-term drought (Vries et al., 2012), but they cannot be adapted to the sudden change in environmental conditions. For instance, sustained drought would break the original balance in the soil nematode community. Therefore, the quantity and genera of soil nematodes decreased.

4.2. Effects of different drought treatments on community composition of soil nematodes

It is difficult to carry out the response analysis of nematode communities to soil moisture changes at the generic level based on field data due to the possible differences in species composition of a genera among various experimental fields. In response to the drought treatment, trophic groups of soil nematodes showed different characteristics. The studies demonstrated that sustained drought led to the decrease in the quantities of *Ba* nematode and *OP* nematode. The quantity of *PP* nematode was slightly higher than that in CK, whereas the quantity of *Fu* nematode was slightly lower than that in CK.

Recent experiments suggested the high sensitivity of *Ba* nematodes to drought and compared to other trophic groups, *Ba* nematodes was negatively affected by drought to a certain degree (Bakonyi et al., 2007; Landesman et al., 2011). Meanwhile, the quantity of bacteria decreased, whereas the quantity of fungi was seldom changed under drought treatments (Geng et al., 2015). Therefore, the lower soil moisture content had only a slight effect on the quantity of *Fu* nematodes. The quantity of *PP* nematodes gradually increased during the growth season of crops in the farmland ecosystem (Neher and Campbell, 1994). The quantity of *OP* nematodes decreased with the decrease in the microbial biomass under drought treatments (Fitoussi et al., 2016; Geng et al., 2015).

The *c-p* structure was significantly influenced by different drought treatments. The *cp-2* and *cp-3* guilds increased under drought treatments. The proportion of *cp-2* guild to *cp-3* guild represented a slight increase with the increase in drought days because the *cp-2* guild had the strong adaptation capability to the environmental change and the

cp-3 guild was more suitable for living in a dry environment (Yeates, 2003a; Yeates, 2003b).

#### 4.3. Effects of drought on soil nematode community diversity

Nematode community structure was sensitive to environmental disturbances (Bongers and Bongers, 1998). In the study, nematode diversity and generic richness significantly decreased with the increase in drought days. According to previous studies, soil moisture could provide inferior microenvironments for nematodes (Sun, 2013). Soil microenvironment was also a major factor determining the diversity of soil nematodes, which was sensitive to the changes in soil moisture and pH (Chen et al., 2013; Korthals et al., 1996).

Among different plots in CK, soil nematodes had the lowest abundance and dominance, richer species, and the highest diversity. The Simpson index of soil nematodes was linearly increased when the drought conditions were changed from CK to MD and the proportions of the dominant species of soil nematodes were gradually increased with the increase in drought days. The Evenness index of soil nematode was linearly reduced with the increase in drought days and soil nematodes were concentrated in drought environments (Steel and Ferris, 2016; Ying et al., 2016; Zhong et al., 2016).

MI is a sensitive indicator for assessing environment disturbance of soil (Bongers and Bongers, 1998). The lower MI under SD condition was associated with bacterivore dominance and a reduction in omnivores-predators. The decreasing values of MI suggested that the structure of the nematode community was deteriorating and that the complexity of soil food web declined in the SD treatment. The value of PPI showed no significant change under the experimental conditions. The findings of this study showed that the value of the NCR had a decreasing trend, indicating that bacteria were not suitable for living in arid situation (Evans and Burke, 2014; Song et al., 2016).

#### 5. Conclusion

The study results confirmed that microclimatic conditions, such as sustained drought, largely determined the nematode community structure. In this study, the quantity, genera and diversity of soil nematodes in drought treatments were significantly lower than those in the CK. The results suggested that nematode abundances, especially bacterial-feeding nematodes, were highly sensitive to drought and that the changes in soil moisture might play an important role in drought response of soil nematodes. *Eucephalobus* and *Helicotylenchus* were the dominant genera under drought treatments. In addition, with the increase of drought, the worse the soil nutrients and the more disturbed the soil, the structure of the nematode community degenerated and the role of nematodes in soil food web was weakened in the agro-ecosystem after long-term drought. Importantly, soil nematode diversity is highly correlated with soil factors.

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